

In the third chapter some tests of the quality of milk are discussed. The value of milk is gauged by the percentage of butter-fat, and although there are many methods of estimating this, most of those which are trustworthy are troublesome to work. Prof. Muir does not speak well of the lactobutyrometer—an instrument designed for the separation and direct reading of the fat. The method is certainly rough, and almost useless, except in the hands of a very careful worker. There are two methods, not described by Prof. Muir, which are of much greater value and not more troublesome; these are the Babcock milk test and Soxlet's method of estimating fat in milk from a determination of the specific gravity of an ether extract.

In speaking of cream separation on p. 45, Prof. Muir mentions that "some kinds of separator have an arrangement for regulating the thickness of the cream," and also "that frequently separated cream is rather frothy." A fuller treatment of these points would have been useful. The methods of regulating thickness of cream from a separator depend upon varying the rate of revolution of the separator bowl, or else upon varying the time the milk remains in the bowl. The latter plan is most convenient, and is usually effected by diminishing the inflow of milk. In the Danish separator the same end may be secured by adjusting the movable skimming tube. Frothiness of cream is most marked in the case of the Danish machine when the cream is taken off thick. This frothiness might possibly be remedied by using a smaller nozzle for the cream delivery tube.

In dealing with the principles of cheesemaking on p. 69, the author says, "The state of the milk with regard to acidity is of the greatest importance just when the rennet is added, and should it then be too acid little can afterwards be done to counteract the mistake. On the other hand, should the amount of acid be slightly too little, it may be counteracted to some extent in the subsequent processes."

As a matter of fact even the most skilful workers sometimes find the milk too ripe, and in such cases, by hastening the curd into the curd-sink and then washing with water at 100° F., good results may be obtained, at least by the "stirred-curd process."

The book concludes with a short appendix on cream-raising trials, made at the Yorkshire College.

Prof. Muir's manual, though small, is to be welcomed as a most useful addition to our dairy literature.

WALTER THORP.

OUR BOOK SHELF.

William Gilbert of Colchester, Physician of London, on the Loadstone and Magnetic Bodies, and on the Great Magnet the Earth. A New Physiology, Demonstrated with Many Arguments and Experiments. A Translation, by P. Fleury Mottelay. (London: B. Quaritch, 1893.)

AMONG men of science there is no difference of opinion as to the value of the original Latin work, "*De Magnete*," of which this is a translation. Some time ago (*NATURE*, vol. xlii. p. 279) we gave an account of a meeting held at Colchester by members of the Essex Field Club and the Gilbert Club, for the purpose of doing honour to the memory of Gilbert, who was born there in 1540. In a speech delivered at this festival Lord Rayleigh not only

spoke highly of Gilbert's work, but went on to say that although we owe to an investigator who lived so long ago the theory that the earth is a great magnet, we are not much in advance of that position at the present time, as nobody has yet explained the origin of terrestrial magnetism. It was most desirable that a work which may be said to have marked a definite stage in the evolution of physical science should be presented in an English form, and this has now been done by an American scholar, who, as he himself explains, has "translated with latitude, keeping in view the author's sense more particularly than his words, and amplifying without altering the former." Mr. Mottelay has also brought together in a short biographical memoir the leading facts relating to Gilbert's career. The volume is well printed on good paper, and will be very welcome to students of the history of scientific ideas.

Report on Manurial Trials. By Dr. William Somerville. (Newcastle: Ward, 1893.)

THIS pamphlet, extending to 61 pages, gives the results of manurial trials in the county of Northumberland during the season 1892.

The plan of the experiments is an extensive one, but we may say that many of the experiments are designed to show what manures can be economically applied in the growth of turnips and potatoes in ordinary rotation.

From the experiments made upon farms at Rothbury, Ilderton, Tweedmouth, and Wark-on-Tyne, Dr. Somerville concludes that (1) basic slag is the cheapest phosphatic manure, though the best result is obtained with a mixture of slag and superphosphate; (2) kainit up to 2 cwt. per acre is a profitable dressing to turnips and potatoes; (3) the turnip crop requires nitrogenous manure; and (4) small dressings of artificial manures are more directly profitable than large dressings.

It is to be hoped that many of these experiments will be repeated in the county this year. W. T.

The Food of Plants. By A. P. Laurie, M.A., B.Sc. (London: Macmillan Co., 1893.)

THIS little book is intended to be an introduction to agricultural chemistry. It contains descriptions of a series of simple experiments which may be undertaken without any previous knowledge of chemistry. These experiments illustrate the part played by water in the nutrition of plants, the nature of the soil and of the air, and how plants obtain their food from these sources, &c.

The experiments are carefully chosen and described, and can be performed with inexpensive materials, and the book, especially if used as the author suggests, in conjunction with a Chemistry Primer, can well be recommended as an interesting guide to the study of agriculture.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of *NATURE*. No notice is taken of anonymous communications.]

Fossil Floras and Climate.

I HAVE read with some interest the communications in recent numbers of *NATURE* based on a review by my friend Mr. Starkie Gardner of a book which I have not yet seen; and as an exile in the south owing to a serious illness, I have not means of reference even to my own papers on the topic in discussion. I think, however, it may be well to direct attention to some Canadian facts published in the Transactions of our Royal Society and elsewhere, to which neither Mr. Gardner nor Mr. De Rance have referred.¹

¹ See Report of Dr. G. M. Dawson on the 49th Parallel 1875; Reports Geol. Survey of Canada, 1871-77-79; Transactions Royal Society of Canada, 1883 to 1892.

In Western Canada, in the Rocky Mountains, and in the Queen Charlotte Islands (latitude 55°) we have a lower cretaceous flora, characteristically mesozoic, and even allied to the jurassic. Two of its characteristic species are closely allied to *Divon eduli* of Mexico (*Divonites Columbianus* and *D. borealis*, Dawson). Along with these are species of *Zamites* and of *Podozamites*, and leaves of *Salisburya*, very near to those described by Heer from the so-called jurassic of Siberia. The lowest beds of this series contain no angiosperms; but in beds a little higher these begin to occur. This has been named in Canada the Kootanie flora, from the river of that name in the Rockies. The late Dr. Newberry, in one of his latest papers, described the same flora with identical species as occurring in Montana, and it coincides in part with the Potomac flora of Fontaine in the south-eastern states. Its character and distribution show an extension of warm climate from Florida to the Queen Charlotte Islands, coincident with a great northward extension of the warm waters of the Gulf of Mexico, which in my judgment is sufficient to account for the climatal conditions. This lower cretaceous flora may be considered to be Neocomian in age, and to correspond with the Wealden of England, and the Komé of Heer in Greenland, which shows the extension of at least a temperate climate beyond the latitude of 60°.

The middle cretaceous brought in a still greater extension of the warm Mediterranean Sea of interior North America, indicated by the chalky foraminiferal Niobrara beds of the United States geologists, which extend into Canada. North of these marine beds, however, we have in Canada, in N. lat. 55°, the Dunvegan sandstones and shales, which hold not only cycadaceous plants but a rich angiospermous flora, including such warm temperate genera as *Magnolia* and *Laurus*, with more northern forms as *Betula* and *Populus*. This we regard as a middle cretaceous flora, in its older part approaching the well-known Dakota flora of the United States, and corresponding to the Atané of Heer in Greenland. The climate in this period must have been humid, equable, and temperate, all around the great American Mediterranean; but it is not impossible that our Dunvegan collections may include some plants of mountain districts mixed with those of lower grounds.

This was succeeded by the upper cretaceous, in the older part of which we have the magnificent flora of the coal series of Vancouver Island, which represents a Pacific coast flora, with fan palms, live oaks, and other trees comparable with those of modern Georgia and Florida. By this time, however, there would seem to have been a geographical separation between the Pacific coast and the plains, as the latter have not yet afforded anything equivalent to the Vancouver flora, and there are some indications that, toward the close of the cretaceous, the climate was cooler than previously. This is equivalent to the Patoot series of Heer in Greenland.

The Laramie period proper, that of the lignite tertiary formations of the plains, seems to indicate a swampy and lacustrine condition of the interior plateau, and the rich angiospermous and gymnospermous flora of this time, characterised very markedly by species of *Platanus* and *Sequoia*, has a temperate aspect in Canada, as far north as the McKenzie river. It corresponds with the so-called miocene of Heer in Greenland, but is shown by stratigraphy and by its affinity with the eocene of England and Scotland, as described by Mr. Starkie Gardner, to be of that age if not constituting a transition group between the cretaceous and tertiary. The palæobotanists of the United States, at first, following Heer, regarded this flora as miocene. More recently some are disposed to consider it upper cretaceous. In Canada it has all along been regarded as paleocene or eocene, and so far as its flora is concerned this is its true position. In a recent number of NATURE I see that Prof. Osborn is disposed to regard the small mammalia of the Laramie of the United States as of eocene affinities. If so, they will agree with the plants. It seems more difficult to account for the great northward extension of the Laramie temperate climate than for that of the preceding cretaceous, as the great Mediterranean of the latter seems to have dried up, though still existing in part, or replaced by swamps and lakes. Possibly some other arrangement of the warm Atlantic currents, as suggested by Mr. Starkie Gardner, may have produced some effect, in conjunction with obstruction of the Arctic currents, and a lower level of Greenland.

The general bearing of these facts on American climate is that we have no evidence of a tropical climate in Northern Canada

or Greenland, but that both the geographical and botanical facts indicate a warm temperate climate, at least in the cretaceous period, and that in the earlier eocene the climate was becoming cooler and less equable.

We have little to show for the miocene; but what there is, as in the Similkameen flora of British Columbia, would go to show a cooler climate and more of local variation.

I have little faith in attempts to deduce a mean temperature in degrees of Fahrenheit from fossil plants; but if carefully collected, so as to keep separate those that belong to different horizons, and if studied in strict relation to the geological conditions of their occurrence, they must afford excellent general indications of climate. Allowance must, however, be made just as in the case of animal fossils, for differences of station, altitude, &c., and for extent of probable driftage or occurrence *in situ*.¹ In studying large collections of our mesozoic and tertiary fossil plants, from different localities and horizons, I have as a geologist naturally had reference to these points, and the work of such men as Selwyn, Richardson, G. M. Dawson, and Mr. Connell has left nothing to be desired as to careful collecting and determination of stratigraphical relations, while the study of animal fossils by Mr. Whiteaves has gone on *pari passu* and in harmony with that of the plants.

I sympathise with Mr. De Rance in his defence of Heer's studies of the Greenland plants, for I know that my own work in Canada would be liable to still more severe criticism. It must be borne in mind that the palæobotanist has very imperfect material, and that he is always liable unconsciously to multiply species. If, however, his names serve to designate the things, and if their geological relations are known, an important work has been accomplished—always, however, provisional and liable to correction as new discoveries are made. One of my Kootanie leaves is scarcely distinguishable on the one hand from Heer's *Salisburya sibirica*, and on the other from Lindley's *Cyclopteris digitata*, even when I have specimens of both to compare it with. All may be the same, though referred on the one hand to ferns, on the other to coniferae, and this may not be settled till specimens in fruit are found. But in any case something has been done, and a widely distributed vegetable form has been recognised at a particular stage of the world's history.

I hope to discuss some of these points more fully in a work now in the press.

WM. DAWSON.

Augusta, Georgia, March 13.

P.S.—Since writing the above I have obtained access to a copy of Dall and Harris's "Neozoic Correlation Papers,"² which throws some additional light on the cretaceous and eocene floras of Alaska, which, from its high northern latitude, affords a good term of comparison with Greenland. It would appear that fossil plants occur at two horizons. One of these (Cape Beaufort), according to Lesquereux and Ward, holds species of Neocomian age, equivalent to the Kootanie of British Columbia and to the Komé of Greenland. The other, which occurs at several localities (Elukak, Port Graham, &c.), has a flora evidently of Laramie (eocene) age, and equivalent to the "miocene" of Heer and Lesquereux and to the McKenzie river and lignite tertiary of Canada. The plants are accompanied by lignite, and evidently *in situ*, and clearly prove harmony with Greenland and Northern Canada in two of those periods of high Arctic temperature indicated above.

Notes on a Spider.

I SEND you the following notes on a spider, whose curious habits I had an opportunity of observing, last year, on the West Coast of Africa:—

In the month of August, 1892, I was travelling by hammock from Chama to Sekundi, two small towns on the Gold Coast. That part of the country is somewhat hilly and is covered with "bush" and other forest growth. The road skirts the sea-shore, sometimes following the beach itself, at other times taking turns inland and winding round bases of small hills.

It was about three in the afternoon and I was being leisurely carried along by my bearers, when I noticed in the bushes that bordered the path something which appeared to me to be a sort of white flower.

¹ Ward, of the U.S. Geol. Survey, has directed attention to these points in an excellent paper published by the Survey.

² Bulletin U.S. Geol. Survey, 1892.